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SEVENTH BI-MONTHLY PROGRESS REPORT  
UNIVERSITY OF ALASKA  
ERTS PROJECT 110-14

August 1973 - September 1973

- A. TITLE OF INVESTIGATION: Feasibility Study for Locating Archaeological Village Sites by Satellite Remote Sensing Techniques
- B. PRINCIPAL INVESTIGATOR/GSFD ID: Dr. John P. Cook/UN 597
- C. PROBLEMS IMPEDING INVESTIGATION: None
- D. PROGRESS REPORT:

1. Accomplishments during reporting period: As detailed in our last report, we have generated a second generation set of signatures for the various soils, vegetation types, water bodies and known archaeological sites in our training area. These signatures were mainly developed in the immediate vicinity of "Old Fish Camp", a large archaeological village site.

Since our data analysis plan calls for printing out digital signatures for a portion of an ERTS scene, it is very important that the signatures developed be applicable without modification to a wide geographical area within each scene, if not throughout the whole scene. In terms of archaeological village sites which have a very narrowly-defined signature range (see report No. 6) this could be a significant problem.

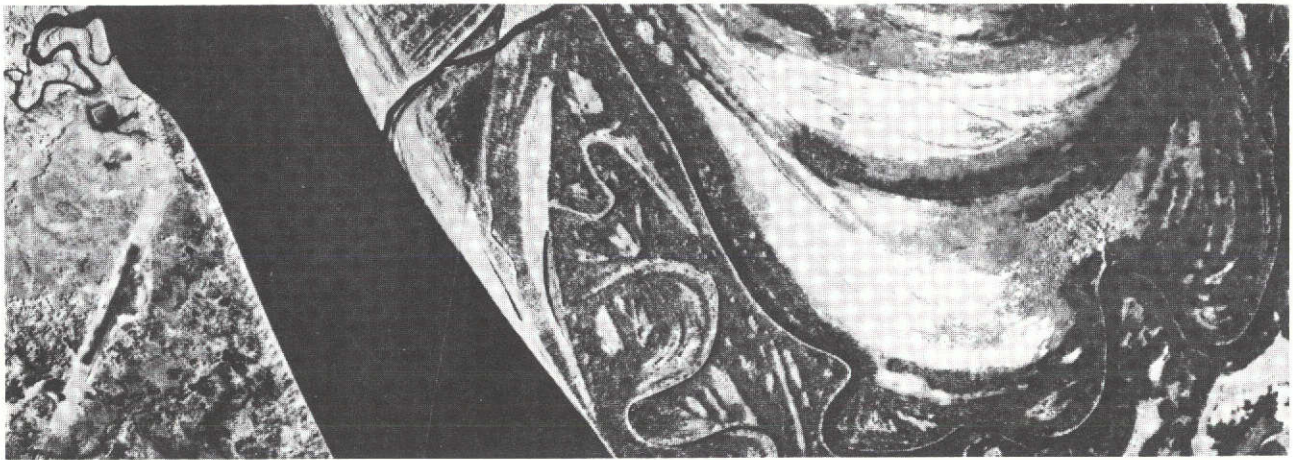
Therefore, before using the digital printout as an inventory of possible archaeological village sites, the printout should be tested at selected locations to determine whether or not signatures of well-known features are being correctly identified. One could then infer that the site signatures are remaining correct also.

This has been done and the results have been found satisfactory. One example of this test is illustrated in Figure 1. This figure consists of a two-frame mosaic of aerial photographs and the corresponding portion of our digital signature printout. The signature symbols are defined in the table below.

E74-10294) FEASIBILITY STUDY FOR  
LOCATING ARCHAEOLOGICAL VILLAGE SITES BY  
SATELLITE REMOTE SENSING TECHNIQUES  
Bimonthly Progress Report, Aug. - (Alaska  
Univ., Fairbanks.) 6 p HC \$3.00 CSCL 08F

N74-17083

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G3/13 00294

[illegible]

Aerial photograph (top) and digital printout of ERTS signatures (bottom) of small 1x2 1/2 mile area including Kaltag, Alaska. Aerial photographs obtained from 5,000 feet. ERTS data obtained from altitude of 500 miles. Digital tape of ERTS scene 1038-21301, covering area 110 miles square, was utilized for printout. Signatures displayed here were obtained through analysis of training area fifteen miles distant.

SYMBOL	CLASSIFICATION
1-7	Signature characteristic of former (archaeological) habitation sites, probability inversely proportional to number
K	Kohtol Slough (slough of Yukon with additional drainage)
L	Lake
Y	Yukon River
P	Stands of predominately large spruce
T	Large trees (combinations of spruce, birch and aspen)
B	Bank of slough (average of slough and vegetation)
F	Vegetation characteristic of old burn (scrub trees, grass, berries)
X	Combination of mainly small black spruce and some willow and grass
Z	Combination of willows, grass and bare ground
Q	Combination of water puddles, wet bare ground and grass
O	Largely bare grass
+	Submerged sand bar
*	Sand bar
.	Average of general vegetation, sandy bare ground and water

The area illustrated here contains the present-day village of Kaltag, located on the west bank of the Yukon River just below the top of the photograph. The village and its airstrip have been outlined by rectangles on the printout. It is interesting to note that because there were no present-day habitation sites in the signature training area, no signatures were developed for that kind of feature. Consequently, the Kaltag area is largely blank on the printout. Three signatures can be found within the village area: the dot (.) signature standing for an average of general vegetation, sandy bare ground and water (in that order), the "F" signature standing for vegetation characteristic of a burned area (approx. 15 years before), and a "7" signature representing vegetation characteristic of an archaeological site.

The occurrence of the dot within the village should be expected; there are large expanses of bare ground (paths, roads, dog tie-down areas, wood-chopping areas, etc.) and other areas of grass including some sod roofs. The two "F" picels within the village and the large area of "F" picels to the west probably result from a fire adjacent to the village within the historic past. The archaeological signature within and those adjacent to the village very likely do not indicate old habitation sites but rather

vegetation characteristic of modification of soil conditions due to nearby human occupation (fertilization, etc.). That is, the conditions responsible for development of archaeological site signatures probably apply at least in part in areas adjacent to present day villages.

Across the Yukon River from Kaltag, a slough of the Yukon can be seen which meanders first east, then south, then east with a small gooseneck to the north and finally north. The presence of Yukon River water in the slough is demonstrated by the occasional "Y" signature found along its course. One should note that in order for a pixel to be labeled with a "Y" signature, it must be fortuitously located squarely within the banks of the slough. Otherwise spectral averaging will occur with the result that the reflectance levels measured correspond to a different signature, or more likely to no defined signature at all. This result can be seen between the "Y"'s. The "B" signature which was developed to define the bank of a slough with different spectral characteristics than the Yukon River, was still close enough to define the bank of the slough in some places. More importantly, however, the "B" signature traced this slough of Yukon River water after it became so narrow that spectral averaging took place in all pixels containing it. This is an added utility of that signature not anticipated.

The banks of slough such as this one are usually elevated due to deposition of material during flooding. Very often this elevated area contains large spruce and birch trees. This phenomena is particularly well illustrated here on the east side of the south-going portion of the slough. Note the band of "T" and "P" signatures paralleling this portion of the slough.

Blank areas generally contain vegetation not found in the training area. At this point signatures for these unidentified areas could be determined. Of particular note is the blank area just north (above) of the gooseneck of the slough. Examination of the aerial photograph shows this area to contain vegetation considerably different in appearance from any other in the photograph with the possible exception of that found in some portions of the dried-up ox-bow lakes between the Yukon River and the south-going part of the slough. This vegetation is probably a stand of large willows.

Along the east bank of the Yukon River can be found a number of picels represented by archaeological village site signatures. One should recall that a "1" is the most probable and a "7" the least probable site signature. Three areas of relatively high average site probability have been delineated on the printout. When Schwatka surveyed the Yukon River in 1887, he indicated the village of "Khaltag" at approximately this location. This identification has not been field-checked.

We have concluded that the signatures developed are valid over a wide geographical area. The distance between the area used here to test signature validity and the training area where the signatures were developed is approximately fifteen miles.

2. Plans for next reporting period: Digital signature printouts of the Khotol Flats area will be examined for signatures of archaeological village sites. Locations of probable sites will be placed on USGS 1:63,360 maps.

- E. SIGNIFICANT RESULTS: See attached sheet
- F. PUBLICATIONS: None
- G. RECOMMENDATIONS: None
- H. CHANGES IN STANDING ORDER FORMS: None
- I. ERTS IMAGE DESCRIPTION FORMS: None
- J. DATA REQUEST FORMS: None
- K. REFERENCES: Schwatka, John F., Compilation of Narratives of Explorations in Alaska, 56th Congress 1st session, Senate, Report No. 1023, April 18, 1900. U.S. Government Printing Office.

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Village Sites by Satellite Remote Sensing  
Techniques

DISCIPLINE: Archaeology

SUBDISCIPLINES: Demography, Interpretation Techniques Development

SUMMARY OF SIGNIFICANT RESULTS: None

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